Low-mass dileptons from bremsstrahlung*

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We calculate production rate of low mass dileptons from the coherent deceleration of the charged ions in a relativistic heavy ion collision. Due to the large transverse size of the nuclei, one expects that main contribution to the dilepton production is at small transverse momenta. Therefore, the coherent "bremsstrahlung" process may be a considerable background for the proposed signal of the chiral phase transition, such as dilepton production from DCC states [1]. Also, if sufficiently large, this source may help explain the observed access in the dilepton production as reported by the CERES collaboration [2]. Indeed, recently [3], it was reported that the production of omega mesons due to coherent deceleration may provide a significant contribution to the dilepton yield.

The dilepton yield from the coherent 'bremsstrahlung' is given by

$$\frac{dN_{l^+l^-}}{d^4q} = \frac{\alpha^2}{6\pi^3}\frac{1}{q^4}(q^\mu q^\nu - q^2 g^{\mu\nu})J_\mu(q)J_\nu^*(q) \quad (1)$$

where $J_\mu(q)$ is the Fourier transform of the electromagnetic current of the colliding nuclei. Assuming that the charge distribution of the nuclei is given by a Gaussian and given a simple deceleration profile $y(t) = y_i + \frac{y_f - y_i}{t_f - t_i}t$ for $t_i \leq t \leq t_f$, calculation of the 'bremsstrahlung' dileptons is straightforward. The resulting dilepton spectrum normalized with respect to the number of charged particles in a central Au+Pb collision is shown in figures 1 and 2 for two different deceleration times, with and without CERES acceptance cuts.

[1] Y. Kluger et al., Phys. Rev. C57 (1998) 280.
[2] G. Agakichiev et al., Phys. Rev. Lett. 75 (1995) 1272; Phys. Lett. B422 (1998) 405.
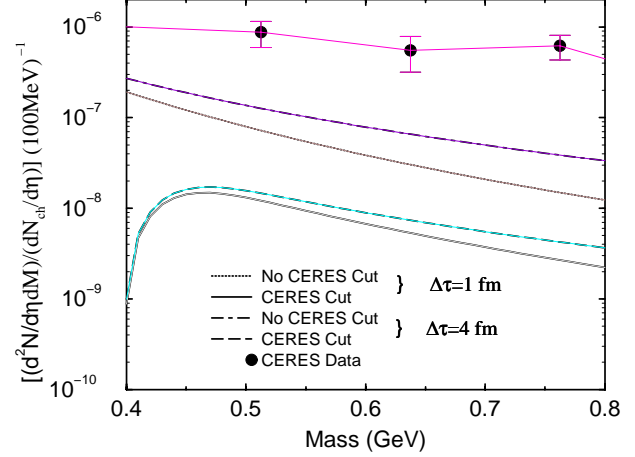[3] I. Mishustin et al., J. Phys. G24 (1998) L17.

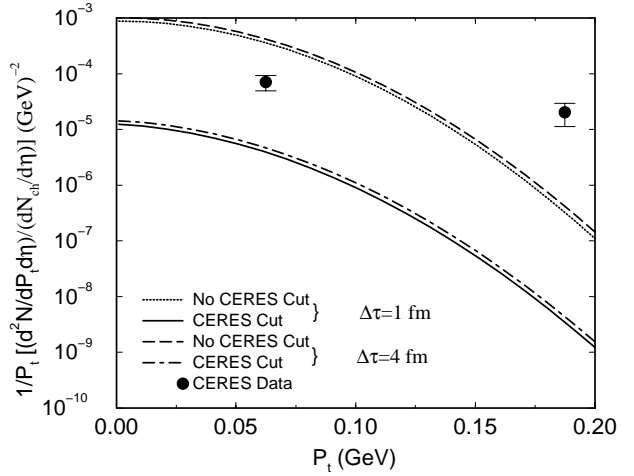Figure 1: Bremsstrahlung dilepton invariant mass spectrum for Au+Pb collisions at 156 A GeV.

Figure 2: Bremsstrahlung dilepton p_t spectrum for Au+Pb collisions at 156 A GeV.